§ 91.417 Fuel flow measurement specifications.

(a) Fuel flow measurement is required only for raw testing but is allowed for dilute testing.

(b) The fuel flow rate measurement instrument must have a minimum accuracy of ± 2 percent of full-scale flow rate for each measurement range used.

§ 91.418 Data evaluation for gaseous emissions.

For the evaluation of the gaseous emissions recording, record the last two minutes of each mode and determine the average values for HC, CO, CO_2, and NO_X during each mode from the average concentration readings determined from the corresponding calibration data.

§ 91.419 Raw emission sampling calculations.

(a) Derive the final test results through the steps described in this section.

(b) Air and fuel flow method. If both air and fuel flow mass rates are measured, the following equations are used to determine the weighted emission values for the test engine:

$$W_{NO_X} = \left(G_{AIRD} + G_{FUEL}\right) \times \frac{M_{NO_2}}{M_{exh}} \times WNO_X \times K_H \times \frac{1}{10^6}$$

$$W_{HC} = \left(G_{AIRD} + G_{FUEL}\right) \times \frac{M_{HC_{exh}}}{M_{exh}} \times WHC \times \frac{1}{10^6}$$

$$W_{CO} = \left(G_{AIRD} + G_{FUEL}\right) \times \frac{M_{CO}}{M_{exh}} \times WCO \times \frac{1}{10^2}$$

Where:

W_{HC} = Mass rate of HC in exhaust [g/hr],

G_{AIRD} = Intake air mass flow rate on dry basis [g/hr],

G_{FUEL} = Fuel mass flow rate [g/hr],

M_{HCexh} = Molecular weight of hydrocarbons in the exhaust; see the following equation:

$$M_{HC_{exh}} + 12.01 + 1.008 \times \alpha$$

Where:

α=Hydrocarbon/carbon atomic ratio of the fuel.

M_{exh}=Molecular weight of the total exhaust; see the following equation:

$$M_{exh} = \frac{M_{HC_{exh}} \times WHC}{10^6} + \frac{28.01 \times WCO}{10^2} + \frac{44.1 \times WCO_2}{10^2} + \frac{46.01 \times WNO_x}{10^6} + \frac{2.016 \times WH_2}{10^2} + 18.01 \times (1 - K) + 28.01 \times \frac{\left[100 - \frac{WHC}{10^4} - WCO - WCO_2 - \frac{WNO_x}{10^4} - WH_2 - 100 \times (1 - K)\right]}{10^2}$$

Where:

WHC = HC volume concentration in exhaust, ppmC wet

WCO = CO percent concentration in the exhaust, wet

DCO = CO percent concentration in the exhaust, dry

WCO_2 = CO_2 percent concentration in the exhaust, wet